Measuring Sun Intensity Using Campbell-Stokes Sun Charts

A Project by Matthew P. Rogan in partnership with the ESIP Federation

Blue Hill Weather Observatory, Milton, MA:

Located in the Blue Hills roughly 10 miles south of Boston, MA, the observatory was founded in 1884 by Arthur Lawrence Rotch and has been collecting weather data in a consistent manner ever since. It is a benchmark site with the longest continuous weather records in North America at 125 years. Besides its lengthily records, the observatory is best known for its pioneering work launching some of the first kite soundings in the 1890's which contributed significantly to the study of clouds.

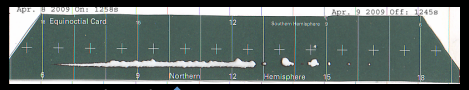
Campbell –Stokes Sunshine Recorder:

Originally developed by John F. Campbell in 1853 and modified by George G. Stokes in 1879 the recorder uses a glass ball to magnify sunlight which burns holes in a paper chart over the course of a day.

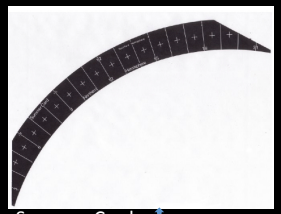
Device:

Charts:

Winter Card



Equinoctial Card



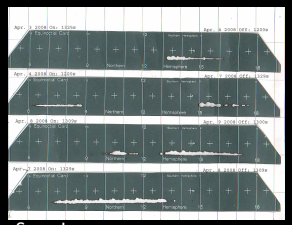
Summer Card

Procedure:

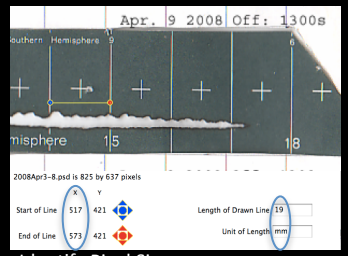
-Four years of equinoctial Campbell-Stokes charts and 1 year of all 3 charts scanned onto a computer at BHO.

-Analyzed scanned images of cards using "Analyzing Digital Images" software developed by John Pickle.

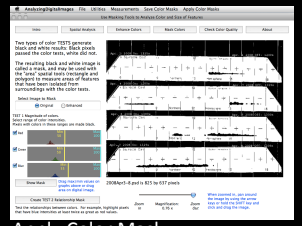
-Quantify the size of the burn on C-S charts.



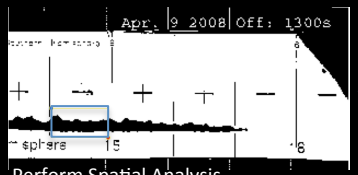
Scan Images



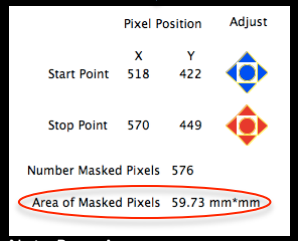
Identify Pixel Size



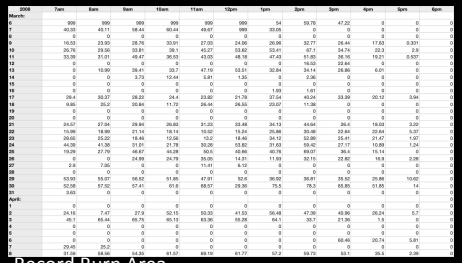
Apply Color Mask



Perform Spatial Analysis



Note Burn Area



Record Burn Area

Further Analysis:

-Compare Campbell-Stokes burn area data with hourly cloud observations at BHO.

-Compare burn area data with pyrheliometer data at BHO.

-Analyze entire 125 year data set.